

MOSFET – Power, Single N-Channel, DFN5/DFNW5

60 V, 250 A, 1.3 mΩ

NVMFS5H600NL

Features

- Small Footprint (5x6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter			Value	Unit
V _{DSS}	Drain-to-Source Voltage			60	V
V _{GS}	Gate-to-Source Voltage			±20	V
I _D	Continuous Drain Current R _{θJC} (Notes 1, 3)	Steady State	T _C = 25°C	250	A
			T _C = 100°C	160	
P _D	Power Dissipation R _{θJC} (Note 1)		T _C = 25°C	160	W
		T _C = 100°C	63		
I _D	Continuous Drain Current R _{θJA} (Notes 1, 2, 3)	Steady State	T _A = 25°C	35	A
			T _A = 100°C	22	
P _D	Power Dissipation R _{θJA} (Notes 1, 2)		T _A = 25°C	3.3	W
		T _A = 100°C	1.3		
I _{DM}	Pulsed Drain Current	T _A = 25°C, t _p = 10 μs		900	A
T _J , T _{stg}	Operating Junction and Storage Temperature			−55 to + 175	°C
I _S	Source Current (Body Diode)			170	A
E _{AS}	Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 26 A)			338	mJ
T _L	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			260	°C

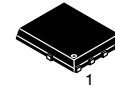
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS

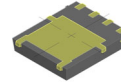
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction-to-Case – Steady State	0.80	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Note 2)	38	

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

$V_{(BR)DS}$	$R_{DS(ON)}$ MAX	I_D MAX
60 V	1.3 mΩ @ 10 V 1.7 mΩ @ 4.5 V	250 A

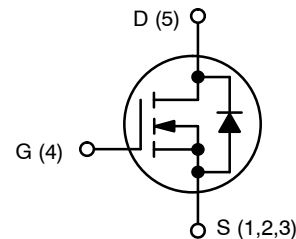


DFN5
CASE 506EZ

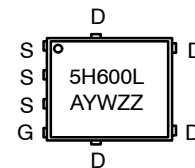


DFNW5
CASE 507BA

N-CHANNEL MOSFET



MARKING DIAGRAM



5H600L = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 5.

NVMFS5H600NL

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	60			V
V _{(BR)DSS} /T _J	Drain-to-Source Breakdown Voltage Temperature Coefficient			34.3		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} = 0 V, V _{DS} = 60 V	T _J = 25 °C		10	μA
			T _J = 125°C		250	
I _{GSS}	Gate-to-Source Leakage Current	V _{DS} = 0 V, V _{GS} = 20 V			100	nA

ON CHARACTERISTICS (Note 4)

V _{GS(TH)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 250 μA	1.2		2.0	V
V _{GS(TH)} /T _J	Threshold Temperature Coefficient			-5.0		mV/°C
R _{DS(on)}	Drain-to-Source On Resistance	V _{GS} = 10 V	I _D = 50 A	1.1	1.3	mΩ
		V _{GS} = 4.5 V	I _D = 50 A	1.4	1.7	
g _{FS}	Forward Transconductance	V _{DS} = 15 V, I _D = 50 A		280		S

CHARGES, CAPACITANCES & GATE RESISTANCE

C _{ISS}	Input Capacitance	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 30 V		6680		pF
C _{OSS}	Output Capacitance			1230		
C _{RSS}	Reverse Transfer Capacitance			30		
Q _{OSS}	Output Charge	V _{GS} = 0 V, V _{DD} = 30 V		100		nC
Q _{G(TOT)}	Total Gate Charge	V _{GS} = 4.5 V, V _{DS} = 30 V; I _D = 50 A		40		
Q _{G(TOT)}	Total Gate Charge	V _{GS} = 10 V, V _{DS} = 30 V; I _D = 50 A		89		
Q _{G(TH)}	Threshold Gate Charge	V _{GS} = 4.5 V, V _{DS} = 30 V; I _D = 50 A		11		
Q _{GS}	Gate-to-Source Charge			20		
Q _{GD}	Gate-to-Drain Charge			6.5		
V _{GP}	Plateau Voltage			3.0		V

SWITCHING CHARACTERISTICS (Note 5)

t _{d(ON)}	Turn-On Delay Time	V _{GS} = 4.5 V, V _{DS} = 30 V, I _D = 50 A, R _G = 2.5 Ω		28		ns
t _r	Rise Time			130		
t _{d(OFF)}	Turn-Off Delay Time			88		
t _f	Fall Time			160		

DRAIN-SOURCE DIODE CHARACTERISTICS

V _{SD}	Forward Diode Voltage	V _{GS} = 0 V, I _S = 50 A	T _J = 25°C		0.77	1.2	V
			T _J = 125°C		0.63		
t _{RR}	Reverse Recovery Time	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 50 A		72		ns	nC
t _a	Charge Time			36			
t _b	Discharge Time			36			
Q _{RR}	Reverse Recovery Charge			60			

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

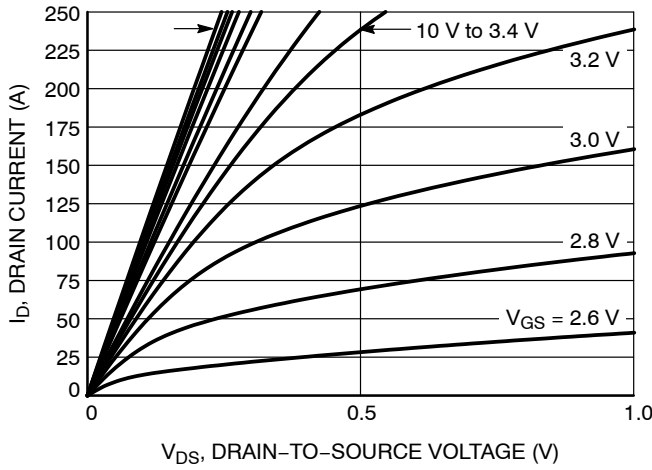


Figure 1. On-Region Characteristics

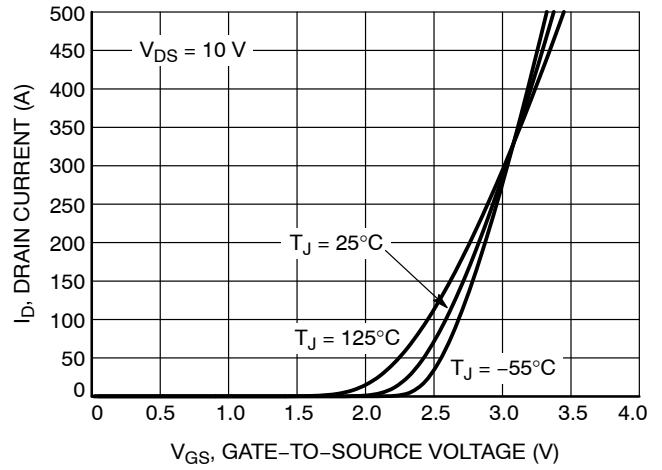


Figure 2. Transfer Characteristics

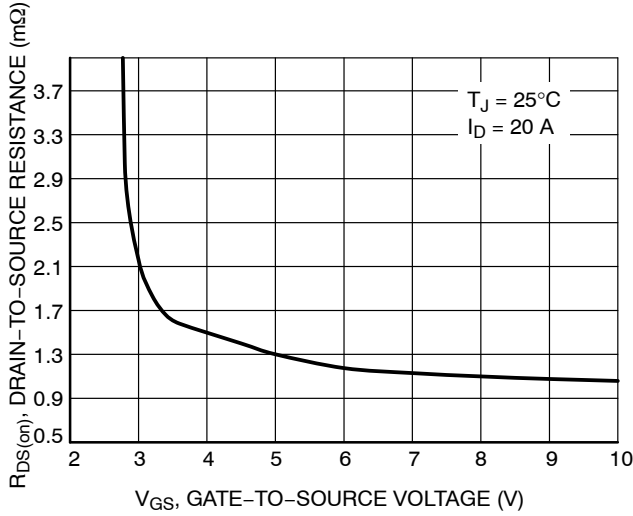


Figure 3. On-Resistance vs. Gate-to-Source Voltage

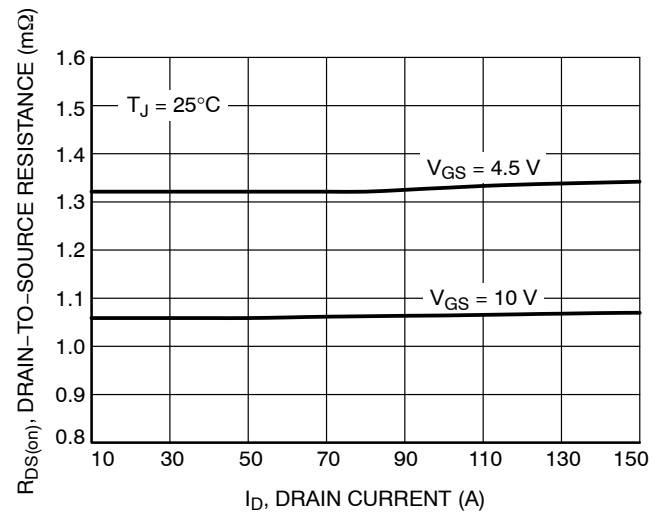


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

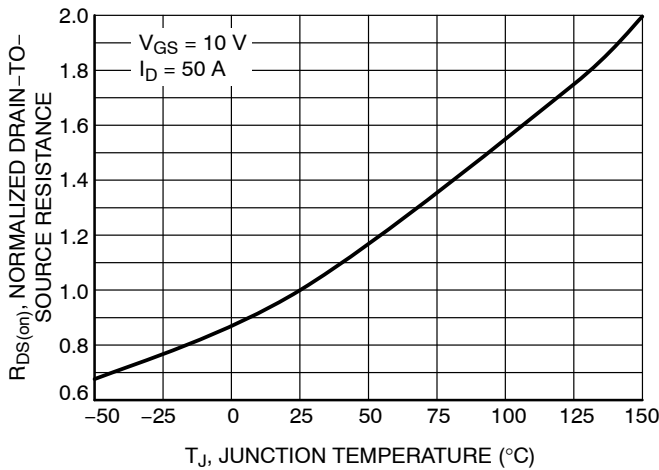


Figure 5. On-Resistance Variation with Temperature

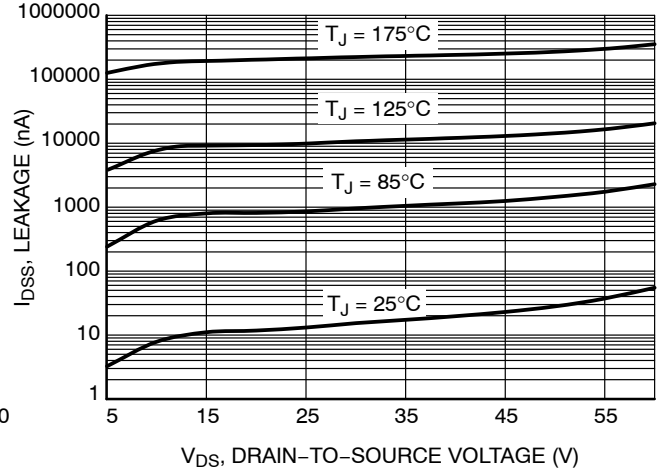


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS (continued)

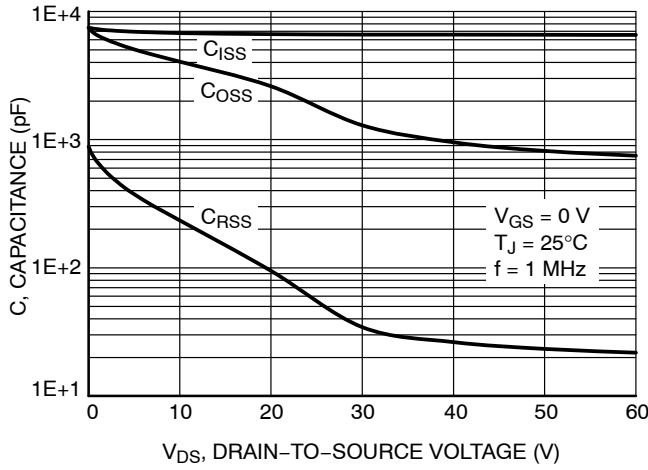


Figure 7. Capacitance Variation

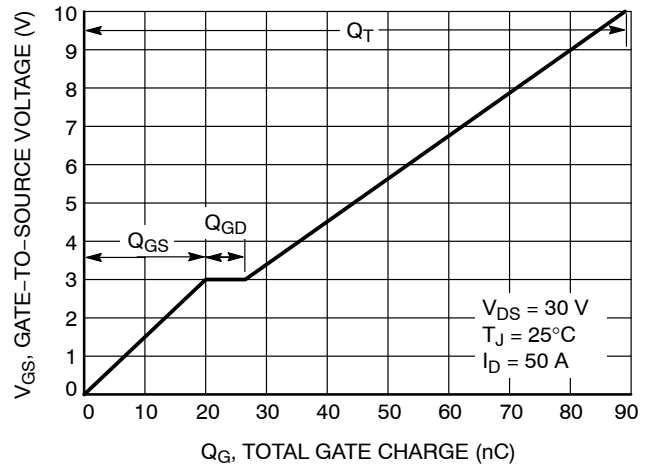


Figure 8. Gate-to-Source Voltage vs. Total Charge

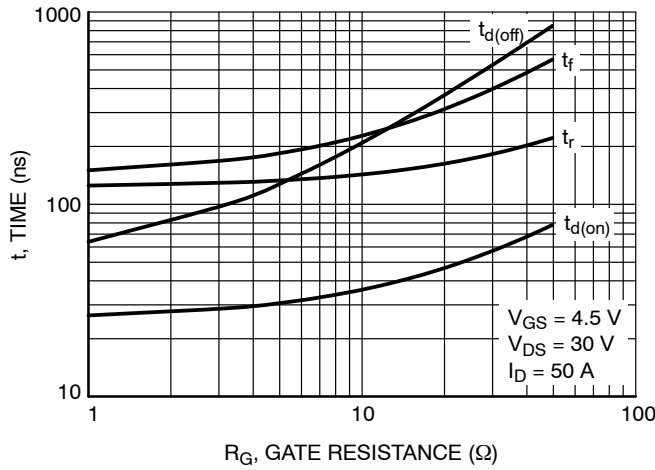


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

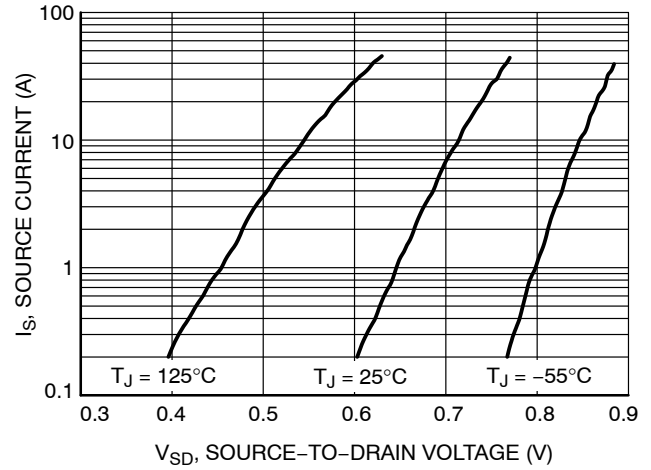


Figure 10. Diode Forward Voltage vs. Current

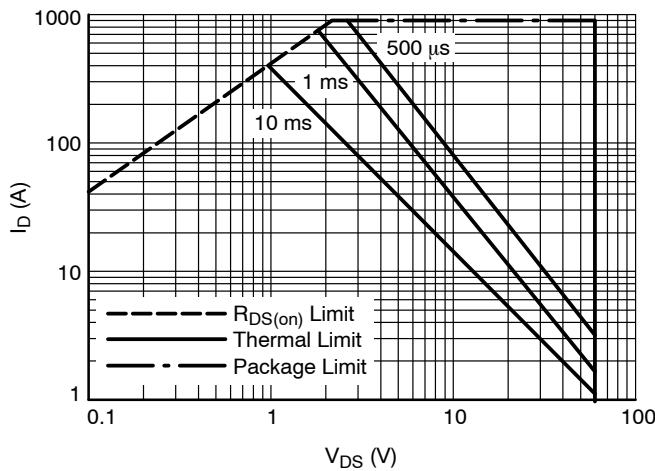


Figure 11. Safe Operating Area

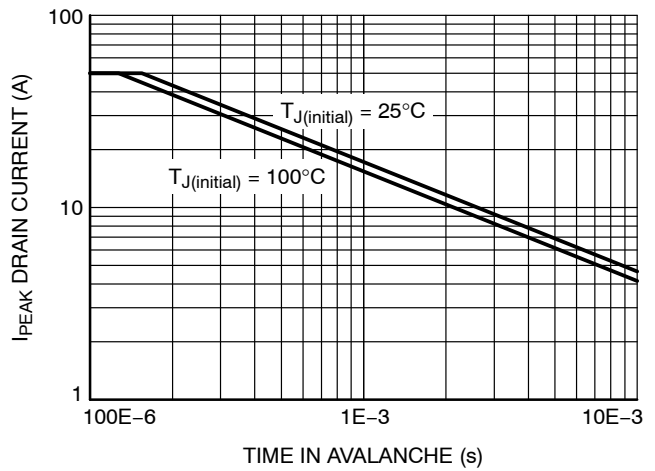


Figure 12. I_{PEAK} vs. Time in Avalanche

NVMFS5H600NL

TYPICAL CHARACTERISTICS (continued)

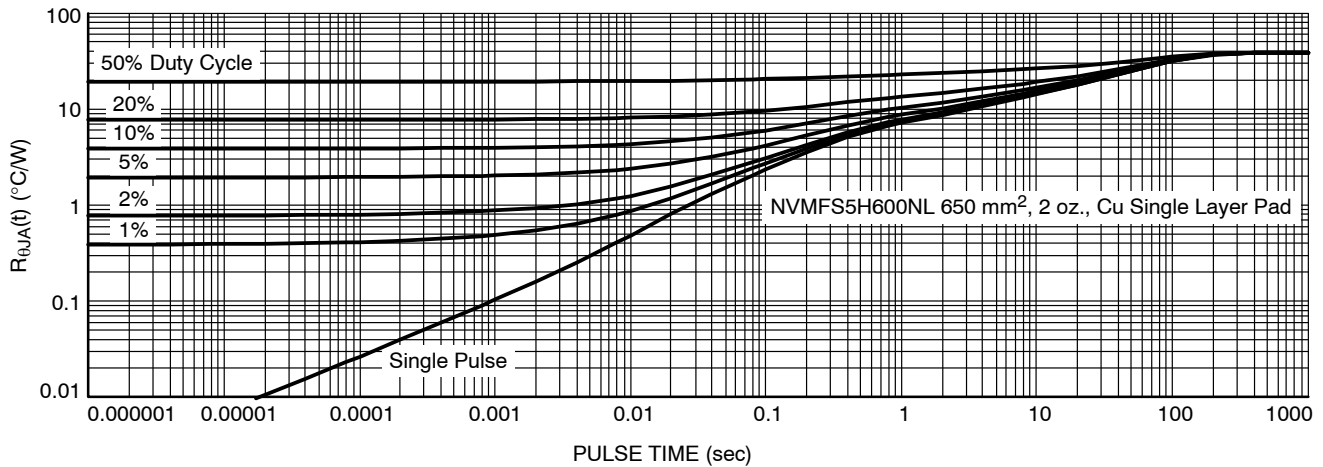


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Case	Marking	Package	Shipping [†]
NVMFS5H600NLT1G	506EZ	5H600L	DFN5 (Pb-Free)	1500 / Tape & Reel

DISCONTINUED (Note 6)

NVMFS5H600NLT3G	506EZ	5H600L	DFN5 (Pb-Free)	5000 / Tape & Reel
NVMFS5H600NLWFT1G	507BA	600LWF	DFNW5 (Pb-Free)	1500 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

6. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.

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